THE MINERAL INDUSTRY OF SIERRA LEONE

By George J. Coakley

The Republic of Sierra Leone is a small coastal West African country bordered by Guinea and Liberia. Sierra Leone has an area of 71,620 square kilometers (km^2) and had an estimated population of approximately 6 million in 2004. Sierra Leone was a producer of cement, diamond, gypsum, and salt and was working on the reopening of significant bauxite and rutile mining operations that were shut down during the civil war (1991-2002), from which the country has been gradually rebounding. United Nations (UN) peacekeeping forces were scheduled to be withdrawn from Sierra Leone and to be redeployed to Liberia by early 2005.

The International Monetary Fund reported that broad-based economic recovery continued in 2004. The expansion of economic output by 7.5% was attributed to robust activity in several sectors, which included diamond production, following the lifting of UN Security Council sanctions on the trade of diamond from Sierra Leone in June 2003. Inflation peaked at 15% during 2004 but was being contained by yearend; it declined to 7.5% by February 2005. The gross domestic product (GDP) based on purchasing power parity was estimated to be $3.335 billion in 2004 and the GDP per capita based on purchasing power parity was $600. Merchandise trade exports increased to $171.8 million from $146.3 million during 2003. Diamond exports accounted for $158.3 million (92% of export trade) in 2004 and $126.2 million (86.3% of export trade) in 2003. The Government collected a 3% royalty on diamond exports. The decline in total merchandise imports to $122.3 million from $139.7 million in 2003 was attributed to the phased withdrawal of UN peacekeeping forces (International Monetary Fund, 2005a§,[1] b§; U.S. Central Intelligence Agency, 2005§).

Government Policies and Programs

Mining in Sierra Leone is regulated by the Mines and Minerals (Amendment) Act of 1994 and by the Mines and Minerals (Amendment) Act of 2003, which added specific penalties for diamond smuggling. The Petroleum Act of 2001 regulates petroleum activities. In October 2003, the Ministry of Mineral Resources formally announced a new "Core Mineral Policy" designed to revive the mining sector, which contributed more than 70% of the country's foreign exchange earnings, 20% of the GDP, and 15% of fiscal revenues during the 1960s and 1970s. It calls for the review of all mining laws and regulations to make them internationally competitive. Its aim is to have four or five large mechanized bauxite, diamond, gold, and rutile mines in operation by 2008; to reduce illegal diamond mining and smuggling; and to improve the social, environmental, and economic performance of artisanal and small-scale mining (Sierra Leone Ministry of Mineral Resources, 2005a§; b§).

The Ministry of Mineral Resources is responsible for administration, the issuance of licenses, field monitoring, and enforcement; records are maintained at the Ministry in Freetown and in local mining offices. The Mines and Minerals Act recognizes the following types of mineral licenses: nonexclusive prospecting, exclusive prospecting, exploration, and mining. Artisanal mining licenses can be issued only to a Sierra Leonean citizen. By 2004, 2,300 artisanal mining licenses and 80 prospecting and exploration licenses had been issued. In the case of diamond, all miners are required to obtain a license from the Director of Mines, as are dealers and exporters. A miner may legally sell stones only to a licensed dealer or exporter, and a dealer, only to an exporter. Monitoring is conducted through a field system of Mines Monitoring Officers and Mine Wardens. In 2004, the Government created a Precious Metals Monitoring Team that comprises eight police officers and eight Mines Monitoring Officers with the intent of curbing illicit mining activities. During 2004, responsibility for implementing Sierra Leone's participation in and compliance with the international diamond trade control requirements of the Kimberley Process Certification System (KPCS) was transferred from the Government Gold and Diamond Office of the Ministry of Mineral Resources to the Gold and Diamond Department of the National Revenue Authority. As part of the Government's effort to facilitate the new diamond valuation and export procedures, the Parliament enacted the Banking Act of 2000, and the Bank of Sierra Leone issued new regulations in 2001. In August 2004, the Parliament passed a new Investment Promotion Act designed to attract foreign investment and to promote value-added production of domestic resources (Sierra Leone Parliament, 2005a§).

In an attempt to address the problem of outsider artisanal and small-scale miners gaining access to mining licenses of Chieftaincy lands, the Government created Chiefdom Mining Allocation Committees to screen potential mining license holders through an informal system before an artisanal diamond mining license application or a small-scale mining company's application is considered by the Ministry. In this way, the legitimacy of land claims that concern a proposed mining site can be examined and problems resolved at the community level. The Government has recognized the following chiefdoms with respect to diamond mining regions: Bo, Bombali, Bonthe, Kailahun, Kambia, Kenema, Koinadugu, Kono, Moyamba, Port Loko, Pujehun, and Tonkolili. Non-Sierra Leonean nationals wishing to take part in mining operations or marketing in these regions must relocate to one of these chiefdoms. The Paramount Chief is the chair of the committee, which consists of five members; the Government's mining engineer serves as technical advisor. The prospective lessee pays surface rent direct to the chiefdom (Sierra Leone Ministry of Mining and Minerals Resources, 2005a§).

The Ministry of Mining and Minerals Resources issues licenses for prospecting, exploration, and mining of diamond, and to dealers and exporters. Artisanal licenses may be issued for terms of up to 2 years, with possible yearly extensions only to diggers from Sierra Leone or to cooperatives registered under the Co-operatives Act Cap 253 and registered with the Director of Mines "for approval to participate in artisanal mining of precious minerals." All financial supporters of artisanal miners must be registered with the

[1] References that include a section mark (§) are found in the Internet References Cited section.

Government's resident mining engineer. Artisanal miners and cooperatives of artisanal miners must pay a set annual fee per acre of Le200,000 ($74).[2]

The U.S. Agency for International Development, in cooperation with Global Witness, the United Kingdom Department for International Development (DFID), the DeBeers Group, and the Rapaport Group of New York, helped fund the Integrated Diamond Management & Policy (IDMP) program and the Peace Diamond Alliance (PDA) in Sierra Leone to organize artisanal diamond mining cooperatives and to implement policy reform in the diamond sector (Integrated Diamond Management & Policy Program, 2005§). The purpose of the PDA is to address inequities in artisanal mining at the local level from harsh, largely unregulated labor conditions, to control environmental degradation, and to improve implementation of the Kimberley Process in the artisanal mining sector through cooperation among Government, civil society, and business. The PDA was launched in December 2002 and was registered as a Sierra Leonean organization in 2004. It is currently based in the Kono District and the Tongo Fields and is expected to expand.

Commodity Review

Metals

Bauxite.—Sierra Minerals Ltd. (a subsidiary of MIL Investments Sarl) was granted a mining license to reopen the Mokanji bauxite mine near Moyamba. The main Gbonge-Mokanji deposit was actively mined between 1963 and 1995. The company expected to produce 1.2 million metric tons per year (Mt/yr) of bauxite at grades of 55% aluminum and 4% silica after blending during a 10-year period; startup was expected sometime during 2005. A second bauxite deposit at Port Loko, which represented the northern extension of the Mokanji Belt, had estimated reserves of 100 million metric tons (Mt) at grades of 48% aluminum and 3% silica. Both deposits have access to favorable rail, road, and port infrastructure. Other deposits were known at Krim-Kpakan in the Pojehun District of southern Sierra Leone, along the Freetown Peninsula, and the Kamakwie and the Makumre deposits in northern Sierra Leone. The bauxite is formed from the tropical weathering of the aluminum-rich hypersthene/feldpsar rich rocks of the high-grade crystalline schists and gneisses of the Kasila Group (Sierra Leone Ministry of Mineral Resources, 2004§, 2005b§).

Gold.—In late 2003, Mano River Resources Inc. of the United Kingdom and its local subsidiary Golden Leo Resources Inc. signed a joint-venture agreement with Golden Star Resources Ltd. of the United States to conduct gold exploration within the Archean greenstone rocks at the Nimini, the Pampana, and the Sonfon properties. Golden Star could earn a 51% interest in the properties by spending $6 million during the following 4 years. A comprehensive soil geochemistry survey was conducted during 2004 (Mano River Resources, 2005§).

Other companies exploring for gold included Harry Winston Inc. through its subsidiary Baomahun Gold Mines Inc., which had exploration licenses at Boamahun and Victoria in the Kamgari Hills, and Golden Prospects plc of the United Kingdom on the Lake Sonfon diamond-gold project. Lake Sonfon was a 50-50 joint venture with Mano River Resources, in which Mano River Resources managed diamond exploration. Golden Star Resources was earning a 50% interest in the gold section of the joint venture and managed gold exploration (Golden Prospects plc., 2005).

Platinum-Group Metals.— Golden Prospects held a 50% interest in the York platinum exploration joint venture on the Freetown Peninsula of Sierra Leone with Jubilee Platinum plc, which was the manager and held the remaining 50% (Golden Prospects plc, 2005§).

Titanium and Zirconium.—Sierra Rutile Ltd. (SRL), which was owned by MIL Investments Sarl of Luxembourg (75%) and U.S. Titanium LLC (25%), planned to restart production of the titanium ores, ilmenite and rutile, from its mine near the Imperri Hills at a capital cost of nearly $70 million. In 2005, SRL will be incorporated into the Titanium Resources Group Ltd. of the United Kingdom, where it will seek additional capital on the Alternative Investment Market of the London Stock Exchange. The company had begun the maintenance and restoration of the mine site in January 2001; it was closed in 1995, which was midway through the prolonged 1991-99 civil war. In the first phase of the project, SRL planned to start producing at a rate of 110,000 metric tons per year (t/yr) of rutile and 20,000 t/yr of ilmenite by the first quarter of 2005 and to reach full operating capacity by yearend 2005. The company planned to increase rutile production to 200,000 t/yr in the second phase (OPIC News, 2003; Africa Mining Intelligence, 2004; Afrol News, 2005§). In March 2003, the U.S. Overseas Private Investment Corp. agreed to provide SRL with an investment guaranty of $25 million to restart and expand mining operations. The European Union provided an additional $25 million under the System for Stabilisation of Export Earnings for Mining Products. SRL also held an exploration license for ilmenite, rutile, and zircon at Rotifunk (OPIC News, 2003; Africa Mining Intelligence, 2004b). At the closure of Sierra Rutile operations in 1995, the remaining reserves were 150 Mt at a grade of 1.5% to 2% rutile at the Gbangbama Group deposits, 180 Mt at a grade of 1.2% to 1.6% rutile at the Sembehun Group deposits, and 235 Mt at a grade of 0.62% rutile at the Rotifunk deposit (Sierra Leone Ministry of Mineral Resources, 2005b§).

Industrial Minerals

Cement.—Sierra Leone Cement Corp. [Heidelberg Cement AG (50%)] operated a cement plant near Freetown that used clinker imported from Norway. Postwar reconstruction led to higher demand for building materials, especially cement. Between 2000 and 2004, cement production increased by 146% to its capacity level of 180,430 metric tons (t) in 2004. To meet demand in 2004, an additional 4,500 t of cement was imported (Bank of Sierra Leone, 2005§).

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[2] Where necessary, values have been converted from Sierra Leone leones (Le) to U.S. dollars (US$) at the rate of Le2,700=US$1. 00 for 2004, and Le2,348=US$1.00 for 2003.

Diamond.—From the 1935 formation of Sierra Leone Selection Trust (SLST) (a subsidiary of De Beers) through 2004, an estimated 14 million carats of diamond have been produced in Sierra Leone. The country is famous for its large high-value stones, which include the 969.8-carat Star of Sierra Leone discovered in 1972, 188- and 283-carat stones found in 1996, a 500-carat boart, and a 110-carat diamond found in 2002 (Mining Journal, 2003b). The majority of diamond production has come from alluvial mining, approximately 70% of which has been from the Kono area. The main diamond mining areas are in the Bo, the Kenema, and the Kono Districts along the drainages of the Bafi, the Mano, the Moa, the Sewa, and the Woa Rivers. Large gravel areas are still intact along these drainages but are buried too deep for normal artisanal exploitation. Diamond production peaked at 2 million carats per year in the late 1960s. In 1971, SLST was nationalized and renamed National Diamond Mining Co. De Beers retained a minority interest until 1984. Beginning in 1971, officially reported production and exports showed a steady decline and bottomed out at 9,300 carats by the end of the 8-year civil war in 1999 (figure 1).

Political and economic reviews of Sierra Leone between 1971 and 2001 highlighted the widespread political corruption and encouragement of illegal mining and smuggling of Sierra Leone's diamonds. In a 2000 report, the non-Governmental organization, Partnership Africa Canada, documented Belgian imports of 770,000 carats from Sierra Leone in 1998 and an average of more than 6 million carats per year from Liberia between 1994 and 1998 (Smillie, Gberie, and Hazleton, 2000§).

Liberian domestic artisanal diamond mining capacity was between 100,000 and 430,000 carats during this period with the difference being in Belgian diamond imports from Liberia, which were most likely attributed to the transiting of smuggled conflict diamond from Sierra Leone, Angola, and the Democratic Republic of the Congo. International efforts to stop such illegal mining and smuggling of diamond that fuels civil conflict led to the creation of the KPCS in November 2002. Sierra Leone, however, was one of the first countries to put in place a UN-approved certification system for the legal export of diamond in October 2000 (Associated Press, 2000§). Exports of diamond have risen dramatically since then from nearly 206,000 carats valued at $26 million in 2001 to 692,000 carats valued at close to $127 million in 2004 (table 2). Table 3 shows the distribution of 2004 production by artisanal and mechanized kimberlite mining.

Between 1999 and 2003, 54% of total diamond exports were industrial-grade stones, and 46%, gem quality. In 2004, nearly 89% of officially reported exports came from artisanal mining. A breakdown of artisanal exports by quality, size, and value is listed in table 4. Although the significant increase in official diamond exports in recent (2000-04) years suggest that the KPCS export controls appear to be working; the consensus of local Government officials, local companies, artisanal cooperatives, and diamond dealers, however, was that only 80% or less of production was being exported through official channels and that illegal diamond mining and smuggling had not yet been entirely halted.

On the basis of reports from the United Nations Mission in Sierra Leone (UNAMSIL) and the Ministry of Mineral Resources, between 560 and 660 significant mining operations, which represented 1,200 mining licenses, chiefly artisanal, were ongoing in Sierra Leone; during 2003, approximately 45% of them were operating legally, and about 50% of the mechanized operations were operating legally. Some of the dealers thought that the increasing Government fee for alluvial diamond mining licenses to $600 from $300 per claim was a disincentive for diggers to work within the system and was encouraging illegal mining.

Koidu Holdings SA was the sole active kimberlite mining operation in Sierra Leone. Koidu Holdings was a joint venture among Energem Resources Inc. (which changed its name from DiamondWorks Ltd. in 2004), 40%; Magma Diamond Resources, 35%; and the Benny Steinmetz Group (BSG Resources), 25%. Following the 1999 coup, the company resumed bulk sampling operations in June 2002 by using a 50-metric-ton-per-hour heavy-medium separation plant, commissioned its main plant in November 2003, and began formal production in January 2004 from two open pits. The $25 million development employed 330 people and operated three shifts, 7 days per week. Between January 2003 and February 2004, the company produced 87,000 carats from two pipes with an average stone size of 0.31 carat. In 2004, Koidu Holdings exported a total of 85,110 carats of diamond at an average value of $177.11 per carat. Capacity of the operation was 120,000 carats per year. Pipe 1 diamond has averaged $223 per carat, and Pipe 2, $183 per carat. The company was preparing to use a vertical pit mining method for Pipe 1 and expected to restart mining by the second quarter of 2005.

An assessment of reserves and resources by Venmyn Rand (Pty) Ltd., which is a South African consulting firm, confirmed the viability of continued mining of Pipes 1 and 2. The higher grade Pipe 1 will be mined at a rate of 20,000 metric tons per month (t/mo) of ore by open pit down to 200 meters (m) and then by sublevel open stoping for an additional 100 m underground. Pipe 2 will be mined by open pit down to 296 m at a rate of 25,000 t/mo. Venmyn estimated probable reserves for Pipe 1 to be 163,000 t at a recovered grade of 0.55 carat per ton at an average value of $230 per carat and for Pipe 2 at 461,000 t at a recovered grade of 0.26 carat per metric ton at an average value of $180 per carat. Total indicated resources for Pipes 1 and 2 and Dyke A were estimated to be 1.43 Mt at a recovered grade of 0.47 carat per ton at an average value of $189 per carat. Total inferred resources were estimated to be 3.545 Mt at a recovered grade of 0.35 carat per ton at an average value of $204 per carat, which gave a total indicated and inferred resources value of approximately $378 million. During 2004, Koidu Holdings won the Government tender to take over the rights to the Tongo area exploration licenses after Rex Mining defaulted on its obligations. The Tongo area contains an estimated diamond resource of 3.6 million carats (Energem Resources Inc, 2005§; Even-Zohar, 2004§; Sierra Leone Ministry of Mineral Resources, 2005b§).

In 2005, 19 companies were exploring for kimberlite and alluvial diamond. One such company was the joint venture of Crown Diamonds Ltd. (51%) and Mano River Resources (49%), which expected to begin production from its Lion Dykes underground mine. The operation expected to recover 1 carat per ton of ore mined at an anticipated value of $200 per carat. The joint venture was also exploring a number of other kimberlite dykes and pipes in the Kono area (Mano River Resources Inc., 2004§). Other active companies included Sierra Leone Diamond Co. Ltd. (formerly Africa Diamond Holdings Ltd.) of the United Kingdom, which had large holdings in the Bo area, along the Sewa River, and in the northeastern and northwestern quadrants of Sierra Leone and conducted a high resolution airborne magnetic survey of its concession. Sierra Diamond Ltd. (a subsidiary of Mano River Resources) was exploring for diamond in the Yengema and the N'Jaiama areas, and Africa Gold and Diamond Co., in the Sando Chieftaincy near Kono. Olympus Development Co. held the license on the Panguma dykes near Tongo; Gondwana (Investments) SA located one kimberlite site in the southeast and held six other licenses in the central and northwestern parts of Sierra Leone; and Cream Minerals Ltd. of Canada held an alluvial mining prospecting license along the Sewa River northeast of Sambuva and an offshore concession that drains the mouths of the diamond-bearing Moa and Mano Rivers.

Mineral Fuels

Petroleum.—In 2004, Sierra Leone did not produce or refine petroleum and was dependent upon imports for its petroleum requirements. Imports of petroleum products amounted to $87.12 million, or nearly 33% of total imports. Through an international tender, the Government awarded three offshore concessions for petroleum exploration in 2003. Repsol YPF SA of Spain acquired offshore exploration Blocks SL-6 and SL-7; Oranto Petroleum Ltd. of Nigeria, Block 5; and 8 Investments Inc. of the United States, Block 4. Each block covered 4,000 km^2 (Oil & Gas Journal, 2003; International Monetary Fund, 2005a§).

Infrastructure

Infrastructure was gradually being rebuilt following the war, but it remained fairly limited. The major international airport and harbor were located in the capital of Freetown. There were two other harbors at Pepel and Sherbro Islands and about 10 inland airstrips, most of which were unpaved. Only 8% of the country's network of 11,300 kilometers of roads was paved. Production of electricity by the National Power Authority decreased by 22.5% to 84.82 gigawatts per hour (Gw/hr) during 2004 owing to frequent breakdown of the electrical generating plants. Industrial consumption decreased by 16.5% to 4.59 Gw/hr. In May 2004, Sierra Leone signed an agreement with the Italian Government for a grant of €18 million ($21.6 million) to complete construction of the Bumbuna Hydroelectric Project by 2006. The Bumbuna Project will generate about 50 megawatts (MW) of electricity at the completion of Phase I and 150 MW at the completion of Phase II (Bank of Sierra Leone, 2005§).

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TABLE 1

SIERRA LEONE: PRODUCTION OF MINERAL COMMODITIES[1]

Commodity		2000	2001	2002	2003[e]	2004[e]
Cement	metric tons	73,396	113,268	144,145	169,109 [2]	180,430 [2]
Diamond[3]	carats	77,372	222,520	351,860	506,819 [2]	691,757 [2]
Gold[e]	kilograms	--	--	--	--	1,000
Gypsum[e]	metric tons	4,000	4,000	4,000	4,000	4,000
Salt	do.	3,289 [r]	2,889 [r]	1,821 [r]	1,005 [2]	827 [2]

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. --Zero.

[1]Table includes data available through October 30, 2005.

[2]Reported figure.

[3]Exports.

Sources: Bank of Sierra Leone, 2004 Annual Report and Statement of Accounts, Salt and Cement Data, accessible online at URL http://www.bankofsierraleone-centralbank.org/pdf/Annual _report _04.pdf; Sierra Leone Ministry of Minerals Resources.

TABLE 2
SIERRA LEONE: DIAMOND EXPORTS, 2001-04

Year	Exports (carats)	Value of exports (in dollars)	Average price (dollars per carat)
2001	205,850	$26,022	$117
2002	351,859	41,732	119
2003	506,723	75,970	150
2004	691,757	126,653	183
Total	1,756,190	270,377	154

Source: Sierra Leone Ministry of Mineral Resources, Gold and Diamond Department.

TABLE 3
SIERRA LEONE: DIAMOND EXPORTS BY SOURCE, 2004

Mining source	Exports (carats)	Value of exports (in dollars)	Average price (dollars per carat)
Artisanal	613,299	$112,793	$184
Kimberlite	78,459	13,860	177
Total	691,757	126,653	183

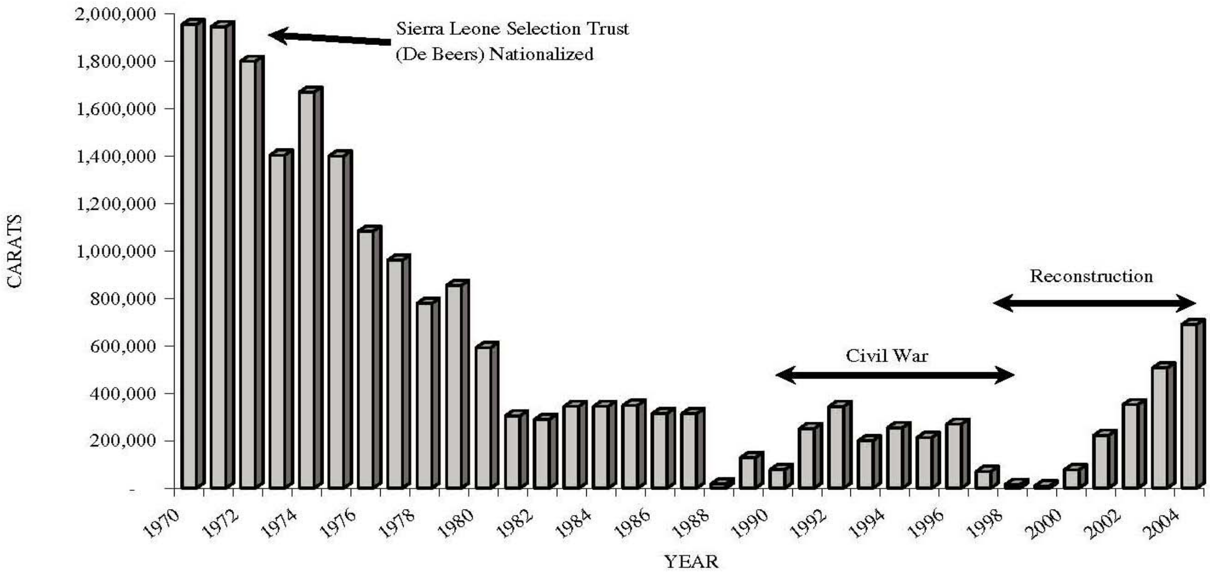
Source: Sierra Leone Ministry of Mineral Resources, Gold and Diamond Department.

TABLE 4
SIERRA LEONE: ANALYSIS OF ARTISANAL DIAMOND EXPORTS IN 2004

	Exports (carats)	Average price (dollars per carat)	Percent by weight	Percent by value
Industrials	303,909	$35	50%	9%
Gem, specials	4,940	2,224	1	10
Gem, plus 3 carats	34,209	1,122	6	34
Gem, small to 8 grains	270,241	196	44	47
Total/Average	613,299	184	100	100

Source: Sierra Leone Ministry of Mineral Resources, Gold and Diamond Department.

FIGURE 1
SIERRA LEONE DIAMOND EXPORTS, 1970-2004



Source: Sierra Leone Ministry of Mineral Resources, Gold and Diamond Department.